

Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R6PIOK

Pine Oak

General Information

Contributors (additional contributors may be listed under "Model Evolution and Comments")

Modelers

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Vegetation Type

Forested

Dominant Species*

PIST PIBA2
PIRE
ACRU
QURU

General Model Sources

- Literature
- Local Data
- Expert Estimate

LANDFIRE Mapping Zones

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Rapid Assessment Model Zones

- California
- Great Basin
- Great Lakes
- Northeast
- Northern Plains
- N-Cent.Rockies
- Pacific Northwest
- South Central
- Southeast
- S. Appalachians
- Southwest

Geographic Range

This PNVG was developed directly from a description found in the Chippewa National Forest Final EIS published 2004. Therefore, it is most applicable in the drift and lakes plains in central Minnesota.

Biophysical Site Description

This PNVG is developed specific to north central Minnesota outwash plains in the proximity of the Chippewa National Forest. Landscape is level to rolling. Soil structure is comprised mostly of loamy sand. Local water table is generally more than 100 cm below the soil surface. Soils are moderately to excessively drained. Soil moisture is moderately dry.

Vegetation Description

Historically, this PNVG had a jack pine, red pine, and white pine supercanopy either alone or as mixed pines. Deciduous trees usually occurred as a subcanopy comprised of quaking aspen, paper birch, northern red oak, bur oak, red maple, and bigtooth aspen. These deciduous trees grow to merchantable size and, in the absence of pines, the deciduous trees would form a cover type.

The mature condition was typically a mix of pines and deciduous trees, frequently with two pine species and a subordinate canopy of three deciduous species. The pine coverage would be 50% to 75%, with the deciduous species making up the balance.

Vertical diversity is definitely a part of these mature and older forests in this system. Oak species and red maple are present at higher levels than aspen and birch in the seedling/sapling size class. This suggests the oak and maple will replace the shorter-lived aspen-birch as the stand ages. Pine species are only a minor part of the understory stocking.

Beaked hazel is the dominant shrub. Large leaved aster is the most commonly found forb.

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

Disturbance Description

Fire was the most common natural disturbance factor in this ecosystem, with an estimated stand replacement return interval of 250-500 years. Usually, stand replacement fire events ranged from tens to hundreds of acres. Surface fires are estimated to have occurred at 5 to 40 year intervals. Wind events leveled stands at an estimated interval of 1,000-2,000 years.

Surface fires appear to be the most common process affecting species composition and structure. These fires removed the understory species, setting mature and older seral classes back one class.

Eventually, a stand replacement event would reinitiate an even-aged stand dominated by aspen, jack pine, red pine, paper birch, northern red oak, bur oak or white pine. These stands were usually a mix of species, comprised of two or more pine species and three or more deciduous species.

As the stands approach 60 years of age, the canopy separation between red pine/white pine and the other species becomes apparent. Surface fires may also create canopy separation, by removing the thinner-barked hardwoods and jack pine, while retaining the thicker-barked red pine and white pine. Pine species would regenerate in patches where surface fires burned hotter.

Aspen and jack pine cover types would succeed to longer-lived species by 75 to 100 years of age. Paper birch and northern red oak would succeed slightly later. Oak species would experience mortality at earlier ages when exposed to drought conditions. Surface fires allowed these species to remain in the stands as regenerating trees.

In the absence of stand-replacement events and surface fires, red maple appears to be the dominant climax species in this ecosystem.

Adjacency or Identification Concerns

None have been identified.

Scale Description

Sources of Scale Data Literature Local Data Expert Estimate

Patch sizes of similar tree species and age composition varied from less than an acre to hundreds of acres. Multi-aged conditions ranged from less than an acre to thousands of acres.

Issues/Problems

Results of this model are highly sensitive to the surface fire dynamic resetting the seral class to the next younger seral class in classes C,D, and E. Sensitivity tests using time since disturbance to control the recurrence of a fire showed significant effects, although these are not included in the final 1/24/2005 model. Additional modification could be made in varying the fire probability based on age/size class, i.e., later seral stages are likely less prone to either surface or replacement fires.

Model Evolution and Comments

This model was built directly from Frelich's Dry Mesic Pine Oak Landscape Ecosystem identified for the Chippewa National Forest for plan revision. Suggested review by Lee Frelich, University of Minnesota, John Almendinger, Ecological Services - Minnesota DNR, Jim Barott, Chippewa National Forest, Jim Gallagher, Chippewa National Forest.

Succession Classes

Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 10%

Early1 All Structures

Description

This class is a regeneration phase from either fire or wind. It consists mainly of aspen, paper birch, jack pine, red pine, white pine, and oak. It is typically a mixture of two pine species and three or more deciduous species, 0-35 years old.

Indicator Species* and Canopy Position

POTR5 Upper
 BEPA Upper
 PIBA2 Upper
 PIRE Upper

Upper Layer Lifeform

- Herbaceous
 Shrub
 Tree

Fuel Model 8**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	0 %	100 %
Height	Shrub Short 0.5-0.9m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

- Upper layer lifeform differs from dominant lifeform.
 Height and cover of dominant lifeform are:

Class B 40%

Mid1 Closed

Description

This stage also includes aspen, paper birch, jack pine, red pine, white pine and oak. A supercanopy and subcanopy would develop as the red pine and white pine continued to grow, while the deciduous species slow in growth as they approach their mature canopy height. Age range is 36-75 years old.

Indicator Species* and Canopy Position

POTR5 Upper
 BEPA Upper
 PIBA2 Upper
 PIRE Upper

Upper Layer Lifeform

- Herbaceous
 Shrub
 Tree

Fuel Model 8**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	50 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

- Upper layer lifeform differs from dominant lifeform.
 Height and cover of dominant lifeform are:

Class C 30%

Late1 Closed

Description

Red pine and white pine dominate the supercanopy as the aspen and jack pine component reached its normal life span; red maple, northern red oak, and bur oak form the subcanopy. Surface fires would allow aspen and paper birch to be present at reduced levels compared to the stand replacement fire events.

Indicator Species* and Canopy Position

PIRE Upper
 PIST Upper
 ACRU Middle
 QURU Middle

Upper Layer Lifeform

- Herbaceous
 Shrub
 Tree

Fuel Model 9**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	50 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

- Upper layer lifeform differs from dominant lifeform.
 Height and cover of dominant lifeform are:

Class D 15%

Late2 Closed

Description

Red pine and white pine supercanopy trees with a subcanopy of oak species and red maple characterize these stages.

Indicator Species* and Canopy Position

PIRE Upper
PIST Upper
ACRU Middle
QURU Middle

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 5%

Late3 Closed

Description

Lifespan of stand is beyond the normal fire rotation. Red maple and red oak replace the pine canopy in the extreme long term.

Indicator Species* and Canopy Position

ACRU Upper
QURU Upper

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

Non-Fire Disturbances Modeled

- Insects/Disease
- Wind/Weather/Stress
- Native Grazing
- Competition
- Other:
- Other:

Fire Regime Group: 3

- I: 0-35 year frequency, low and mixed severity
- II: 0-35 year frequency, replacement severity
- III: 35-200 year frequency, low and mixed severity
- IV: 35-200 year frequency, replacement severity
- V: 200+ year frequency, replacement severity

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

Historical Fire Size (acres)

Avg:
Min:
Max:

Sources of Fire Regime Data

- Literature
- Local Data
- Expert Estimate

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	357			0.00280	19
Mixed					
Surface	85			0.01176	81
All Fires	69			0.01458	

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

References

Field Guide to the Native Plant Communities of Minnesota: the Laurentian mixed forest province. State of Minnesota Department of Natural Resources. 2003.

Chippewa National Forest Land and Resource Management Plan Environmental Impact Statement Appendix G: Landscape Ecosystems. 2004.